Part 50 License Amendment Request (LAR) for Dry Storage Loadings at Oconee

Presentation to the
United States Nuclear Regulatory Commission (NRC)
Rockville, MD
November 1, 2005

Purpose

- **Provide Information to the NRC Concerning:**
  - Duke's suspension of dry storage loadings at Oconee in response to Regulatory Issue Summary (RIS) 2005-05
  - Duke's LAR to address the RIS 2005-05 issues for Oconee
  - Schedule for the LAR submittal to the NRC and requested approval date
- **Obtain NRC Feedback**
  - Can the NRC Staff support Duke's LAR schedule?
  - What can Duke do to expedite the review process?

Duke Representatives

- **Oconee Nuclear Site**
  - Steve Newman - Regulatory Compliance
- **Nuclear General Office**
  - Steve Nesbit - Mgr. Spent Fuel Management
  - Gary Walden - SFM (lead for ONS ISFSI)
  - Joe Coletta - SFM (criticality analyst)
  - William Murphy - SFM (criticality analyst)

Overview

- **Need for LAR** (Nesbit)
- **Scope** (Nesbit)
- **Technical Approach** (Coletta)
- **Schedule** (Walden)
- **Discussion** (ALL)
- **Closing Remarks** (Newman)

Need for LAR

- **Dry Fuel Storage Systems at Oconee**

License	Storage System	Soluble Boron Required During Loading?	Number of Canisters	Time Period
Site-Specific	NUHOMS®-24P	yes	40 (loaded)	1990-1996
General	NUHOMS®-24P	yes	44 (loaded)	1999-2005
General	NUHOMS®-24PHB	yes	28 (to be loaded)	2005-2009

Need for LAR

- **RIS 2005-05**
  - Issued on March 23, 2005
  - Noted potential inconsistencies between regulatory bases of fuel pools and dry storage
    - Potential for unanalyzed condition during dry cask loading in the spent fuel pool
  - Stated that affected licensees must meet both Part 50 and Part 72 requirements for cask loading/unloading in the pool
    - Part 50: credit for burnup is allowed; must show subcriticality in unborated water
    - Part 72: credit for dissolved boron is allowed for demonstrating subcriticality
  - Suggests Part 50 license amendment for burnup credit

Need for LAR

- **Actions on RIS 2005-05**
  - Suspended Oconee dry storage loadings planned for June 2005 (suspension in effect until issue resolved)
  - Entered the issue into Oconee's corrective active program
  - Began development of a request for exemption from 10CFR50.68(b)(1)
  - Changed to LAR approach based on subsequent NRC interactions with other licensees
  - Duke is working through the Nuclear Energy Institute toward a generic resolution of the issue

Scope

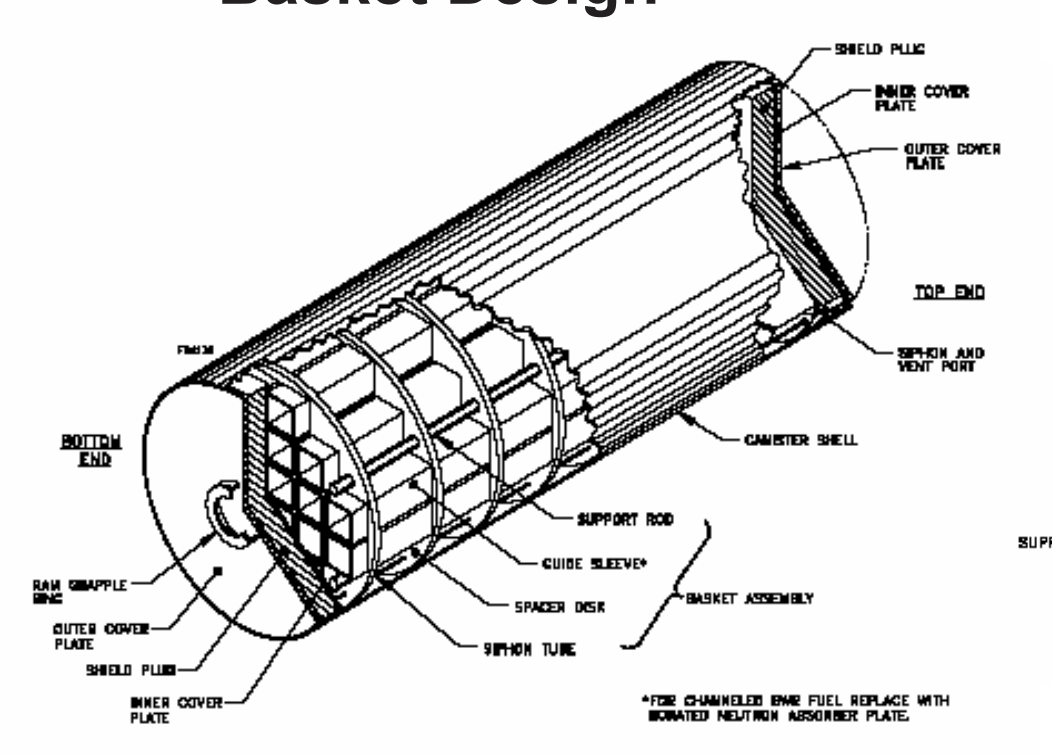
- **New Dry Storage Canister Criticality Analysis**
  - New Part 50 LAR
  - Analysis will address current and previously loaded NUHOMS® canisters
  - Conform to current NRC expectations for soluble boron credit under Part 50
  - No change to NUHOMS® Part 72 licenses or analyses
- **No Change to SFP Storage Rack Analyses**
  - Maintain current Oconee SFP licensing basis
    - Approved by NRC in 2002
    - Based on WCAP 14416

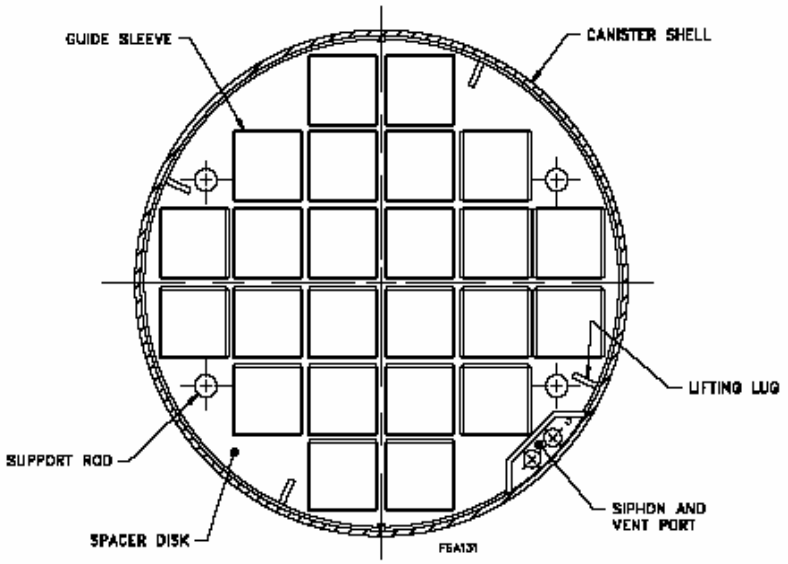
Scope

- **New Part 50 Technical Specification**
  - Establish minimum burnup requirements for fuel to be loaded into dry storage canisters (burnup vs. enrichment curve)
- **Supporting analyses are being developed by Duke**
- **LAR will be crafted with goal of flexibility to evaluate future dry storage casks via the 50.59 process**

Technical Approach

- **NUHOMS®-24P Systems Have Common Basket Design**

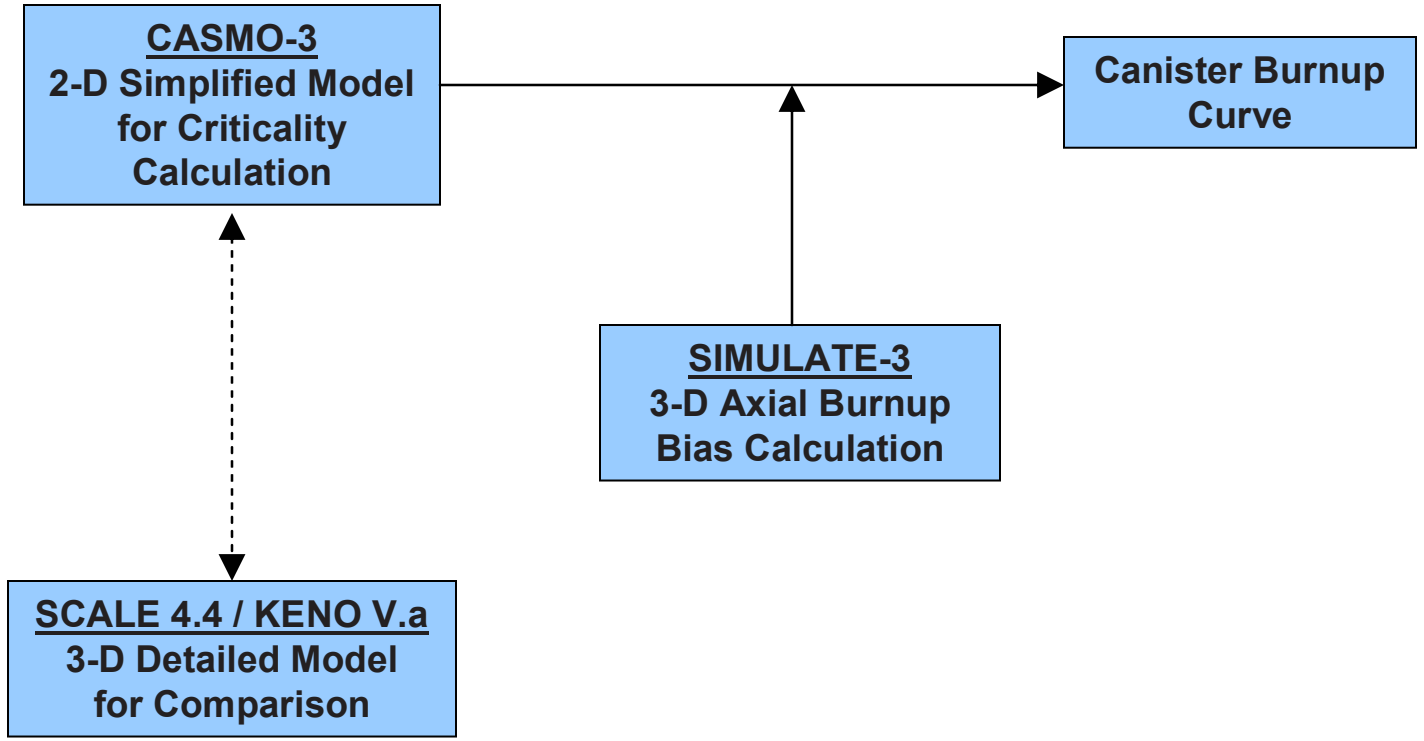




Source: NUHOMS® FSAR, Rev. 8, June 2004

Technical Approach

- **Roadmap to Fuel Burnup Requirements**

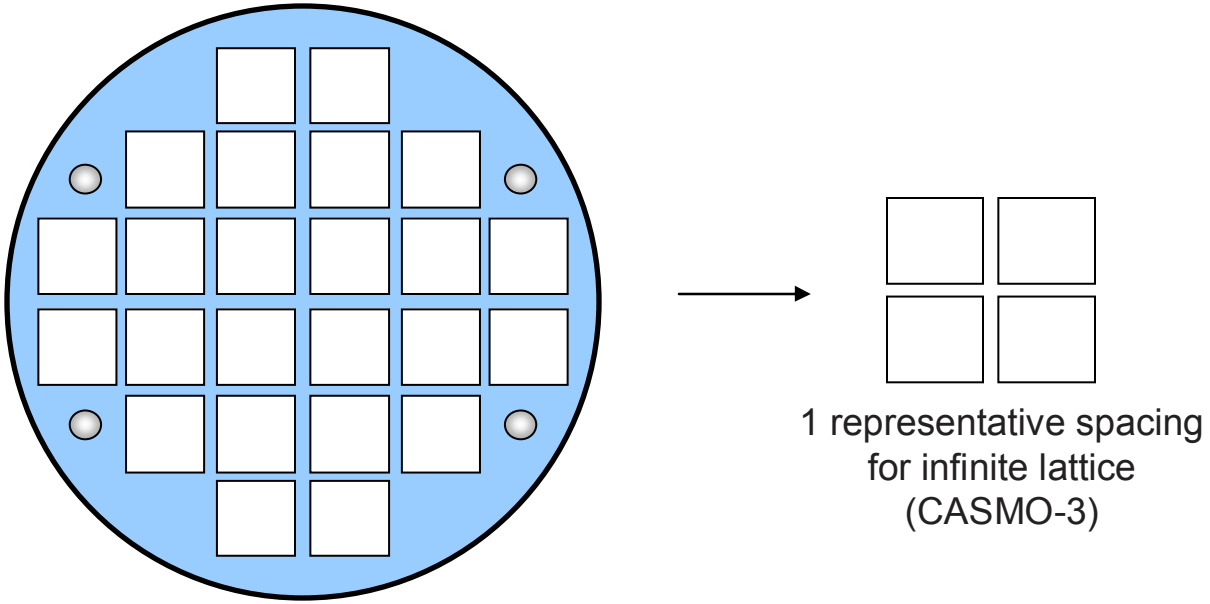


Technical Approach

- **Codes Used for Analysis**
  - CASMO-3
    - Base 2-D model calculations
    - Burnup credit computations
      - Reactor depletion
      - 2-D dry storage canister “rack” calculations with burned fuel
  - SIMULATE-3
    - 3-D axial burnup bias determination
    - Axial bias applied to 95/95 k-eff calculations where positive
  - SCALE 4.4 / KENO V.a
    - 3-D full detail canister model with fresh fuel
    - Used to demonstrate conservatism of CASMO-3

Technical Approach

- **Geometric Models**



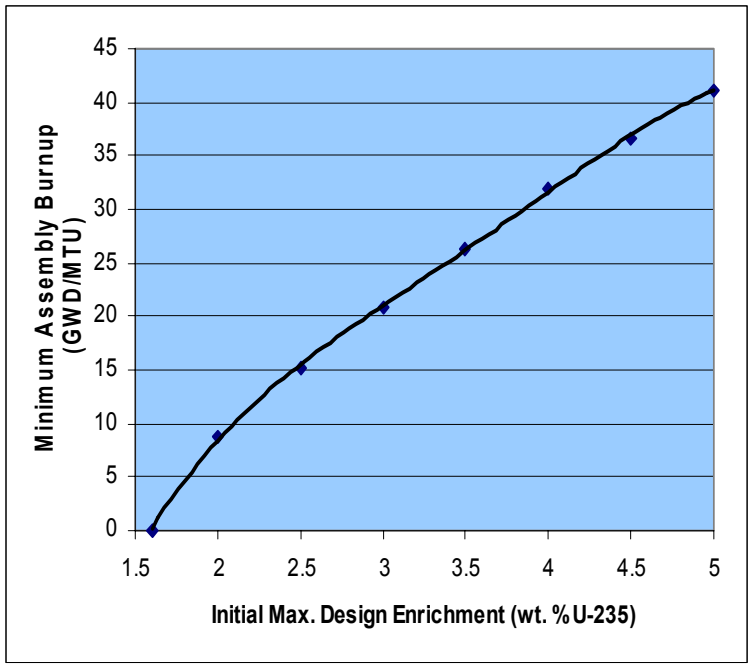
3 different fuel assembly spacings (KENO V.a)

Technical Approach

- **CASMO-3 Computational Canister Model**
  - 2-D infinite lattice
  - Single representative fuel assembly spacing
    - Conservatism will be demonstrated
  - No axial leakage
  - Full density moderator in dry storage canister
    - Water temperature between 32^{o}F and 212^{o}F
    - No moderator in pellet-clad gap
  - Fuel designs: Mark B2-B8; B9; B10; B10L
  - Conservative depletion parameters
  - Credit for 5 years post-irradiation cooling time

Technical Approach

- **Preliminary Results**
  - Curve specifies minimum burnup based on maximum initial enrichment
  - Single “region” within dry storage canister
  - Applies to all analyzed fuel types
  - Applicable to NUHOMS®-24P and NUHOMS®-24PHB



Technical Approach

- **Conservatisms in Analysis**
  - Infinite lattice (radial and axial) canister model
  - In-reactor depletion parameters
    - Boron concentration
    - Moderator temperature
    - Discrete BP presence
    - Fuel temperature
  - Mechanical and burnup-related uncertainties
  - Axial burnup profiles for 3-D bias
  - Most reactive fuel assembly design

Schedule

- **Prudent Operating Reserve (POR) for Oconee**
  - Empty storage cells for core offload during refuel (177)
  - Storage cells empty of irradiated fuel (168)
    - Diver access to repair upender, if needed
    - New fuel assemblies stored in these cells
- **Unit 1/2 Spent Fuel Pool (SFP)**
  - Unit 2 Refuel, Fall 2005: POR not available
  - Unit 1 Refuel, Fall 2006
    - Need to load 4 canisters to restore POR
    - Need to load 2 canisters to store all new fuel in pool
- **Unit 3 SFP**
  - Unit 3 Refuel, Spring 2006: POR not available
  - Unit 3 Refuel, Fall 2007
    - Need to load 3 canisters to restore POR

Schedule

- **LAR Schedule**
  - Submittal to NRC 3/1/06
  - NRC approval 6/1/06